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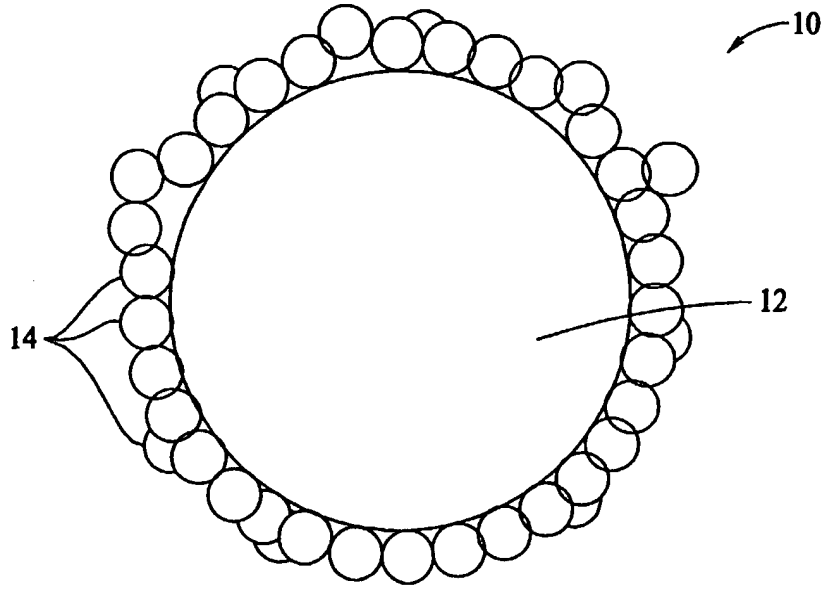
(54) Title: COATED CLUMPING LITTER



(57) Abstract: A clumping animal litter is disclosed which includes clay particles and a swelling agent coated on the clay particles. In one embodiment, the clay particles are manufactured by agglomerating non-swelling clay fines.

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COATED CLUMPING LITTER

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to absorbent materials, and more specifically to, various litter compositions used for the control and removal of animal waste.

[0002] Known litter compositions are fabricated primarily from one of five materials: clay; vegetable matter such as grass, hay or alfalfa; wood chips, shavings or sawdust; paper, such as shredded, flaked or pelletized paper, and Silica Gel. Known clay litters are prone to produce dust, and tracking out by the animal. Further, production of such clay litters results in a large quantity of dust being produced, sometimes referred to as clay fines. Clay fines present a problem to the litter manufacturers since the fines are a waste product and require disposal. In addition such clay products are not biodegradable.

[0003] Sodium bentonite clay is one known material used in the production of litters and is known for its excellent absorption and clumping qualities, as well as for odor retention. However, sodium bentonite is relatively expensive compared to other litter components. Therefore, attempts have been made to reduce the amount of sodium bentonite in clumping litters, for example, mixing pellets of non-absorbing clays with pellets of sodium bentonite clay in varying ratios. However, in these known litters, the properties which are most desirable in the sodium bentonite have been underutilized as most of the clumping and binding qualities of sodium bentonite occur at or near the surface of the clay.

BRIEF DESCRIPTION OF THE INVENTION

[0004] In one aspect, an animal litter is disclosed which comprises clay particles and a swelling agent coated on the clay particles.

[0005] In another aspect, an absorbent material is disclosed which comprises clay particles in a size range of about -10 to about +50 mesh and a coating for the particles which comprises a bentonite powder.

[0006] In still another aspect, a clumping animal litter is disclosed which comprises clay particles in a size range of about -10 to about +50 mesh which are agglomerated from clay fines of less than about -50 mesh size. A coating surrounds the particles.

[0007] In a further aspect, a method for manufacturing a clumping animal litter is disclosed which comprises agglomerating clay fines into particles and coating the particles with a powder.

[0008] In yet another aspect, a clumping animal litter is disclosed which comprises clay particles in a size range of about -10 to about +50 mesh in size and bentonite powder of about 200 mesh size. The powder is applied as a coating to the particles in an amount of about 20% to about 40% by weight.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1 is a cross sectional view of a particle of coated clumping litter.

[0010] Figure 2 is a clumping analysis of several samples of coated clumping litter.

[0011] Figure 3 shows a screen analysis, a bulk density, and a moisture content for each sample analyzed in Figure 2.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Referring to Figure 1, absorbent particles 10 include clay fines agglomerated into clay particles 12, which are coated with a powder 14. In one embodiment, absorbent particles 10 are utilized in an animal litter. The animal litter includes at least one of cat, dog, hamster and livestock litter. The clay fines used in the agglomeration process are less than about -50 mesh in size and are sometimes

referred to as a clay seed base or a seed material. In an exemplary embodiment, clay particles 12 range in size from about -10 mesh to about +50 mesh, based on standard U.S. mesh.

[0013] In an exemplary embodiment, the clay fines are comprised of non-swelling clay and are agglomerated using a pin mixer. A swelling clay powder 14 is applied to particles 12 to form a coating. Powder 14 is the active ingredient of the litter. Exemplary coating powders include at least one of a sodium bentonite powder and a bentonite/guar gum blended powder. In one embodiment, the powder coatings are augmented with at least one of an odor control agent, an anti-microbial agent, an anti-sticking agent, agents for controlling pH, powders for coloring, and other components. Particle 10 is spherical in shape, the shape shown is by way of example only as it is contemplated that a host of shapes and sizes of coated particles can be produced by the embodiments and processes described herein.

[0014] One specific embodiment includes recovery of waste clay fines which include at least one of Calcium-Montmorillonite, smectite, attapulgite, kaolin, opal and combinations thereof. The clay fines are agglomerated in a pin mixer using water as a binder. In one embodiment, the water includes components such as functional components, examples being color, fragrance, liquid calcium, binders, and others. The agglomerated fines have a moisture content of about 20% to about 40%. In another embodiment, the fines have a moisture content of about 28% to about 34%. The agglomerated fines are then coated with a bentonite powder having a size range of about 300 mesh to about 60 mesh. Specifically, the bentonite powder has a size range of about 300 mesh to about 100 mesh. More specifically, the bentonite powder has a size of about 200 mesh. The agglomerated fines are coated with the bentonite powder using a centrifugal coater or a rotary coater/dryer system.

[0015] In one embodiment, the clay fines are fed into a pin mixer using a screw extruder. Moisture (water) is added to the fines to act as a binder, in one embodiment about 28%, while in the pin mixer. The water, in one embodiment, includes components such as functional components, examples being color, fragrance, liquid calcium, binders, and others. The pin mixer includes a shaft with a series of

pins which breaks up any cake formed in the extruder and results in the formation of small, spherically shaped particles which are separated from the cake-like batch using shaker screens. As previously described, in one embodiment, the clay fines are less than about –50 mesh in size and after addition of the moisture in the pin mixing process, result in particles 12 of between about -10 mesh and about +50 mesh in size. Other methods are contemplated which include using binders of guar gum and water or starch and water.

[0016] Another embodiment utilizes a blend of clay fines and bentonite fines with water as a binder, that may or may not include functional components, to produce particles 12 through the pin mixing process. In one embodiment, the swelling clay comprises less than about 15% by weight of the agglomerated particle. Alternatively, the swelling clay comprises between about 10% to about 15% by weight of the agglomerated particle. In a further alternative, the swelling clay comprises less than about 10% by weight of the agglomerated particle. Still another embodiment utilizes sodium bentonite fines with water as a binder, that may or may not include functional components, to produce particles 12 of between about -10 mesh and about +50 mesh in size through the pin mixing process. The agglomerated fines, including the clay and bentonite embodiment, or the bentonite embodiment, are then coated with a bentonite powder of about 200 mesh using a centrifugal coater or a rotary coater/dryer system for improved clumping capability.

[0017] Methods for coating an outer surface of clay particles 12 with powder 14 include utilization of at least one of a fluidized bed dryer, a semi-continuous centrifugal coater or a rotary coating and drying system. In the rotary system, clay particles 12 and powder 14 are tumbled in a drum to mix for about 60 seconds. The litter is removed from the coater and transferred to a dryer. The dryer heats the product to about 200° to about 800° Fahrenheit and the litter is dried until about an 8% moisture content is obtained. More specifically, the litter is heated to about 300° to about 400° Fahrenheit.

[0018] The resulting coated litter is typically in the -8 to +50 mesh size range, with a moisture content from about 15% to about 5%, preferably with a

moisture content of about 8%. In one embodiment, the bentonite coating is about 20% to about 40% by weight of a coated particle. Alternatively, the bentonite coating is about 25% to about 35% by weight of a coated particle. In a further alternative, the bentonite coating is about 30% by weight of a coated particle.

[0019] In an alternative method for producing the litter, the agglomerated fines are placed in a fluidized bed and a bentonite coating is applied as a spray in a low concentration solution.

[0020] Figures 2 and 3 are an analysis of several samples of coated clumping litter which includes 70% by weight particles produced from fines as described above and 30% by weight 200 mesh bentonite coating. Figure 2 illustrates clumping weight and clumping strength for several representative samples and is charted based upon wetting, for example, 15 minutes after wetting with a saline solution, and for 15 minutes, one hour, and 24 hours after being wetted with a standard urine sample. Figure 3 shows a screen analysis, a bulk density, and a moisture content for each sample analyzed in Figure 2. The screen analysis indicates a weight and a percentage for each sample that passed through standard mesh screens, for example, 8, 12, 14, 20, 40, and 50 mesh screens.

[0021] The litter resulting from the compositions and methods described above has superior clumping properties as the active clumping agent is kept on the surface of the particles, where the clumping bonds are formed. In addition, the litter has a dust content which is lower than known clumping litters, resulting in less tracking, as the coating processes described above result in a shell being formed around the agglomerated particles. Further, the litter is easier to remove from litter boxes than known clumping litters as the litter described herein is less likely to attach to litter boxes.

[0022] In the above described embodiments, coating with bentonite provides a litter which includes the clumping and absorption qualities of a litter composed solely of sodium bentonite. However, due to the coating process, the amount by weight of sodium bentonite is reduced over known clumping litters, resulting in more efficient use of the sodium bentonite while providing a production

cost savings over those litters with higher percentage amounts of sodium bentonite. In addition, the coated litter provides a lighter weight product than products using a larger amount of bentonite and has a unique, homogeneous appearance that appeals to consumers. Further, the agglomeration process results in utilization of clay product fines, which heretofore have been considered waste products, and since clay is not biodegradable, clay fines have traditionally required space for disposal.

[0023] While the invention has been described in terms of various specific embodiments, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the claims.

WHAT IS CLAIMED IS:

1. An animal litter comprising:

clay particles; and

a swelling agent coated on said clay particles.

2. An animal litter according to Claim 1 wherein said clay particles comprise at least one of non-swelling particles and swelling particles.

3. An animal litter according to Claim 1 wherein said clay particles comprise agglomerated non-swelling clay fines.

4. An animal litter according to Claim 3 wherein said clay fines have a size of about 50 mesh.

5. An animal litter according to Claim 1 wherein said swelling agent is bentonite.

6. An animal litter according to Claim 1 wherein said swelling agent is a powder.

7. An animal litter according to Claim 1 wherein said swelling agent has a size range of about 60 mesh to about 300 mesh.

8. An animal litter according to Claim 1 wherein said swelling agent has a size of about 200 mesh.

9. An animal litter according to Claim 1 wherein said non-swelling particles have a size range of about –10 to about +50 mesh.

10. An animal litter according to Claim 1 wherein said swelling agent is about 20% to about 40% by weight of the animal litter.

11. An animal litter according to Claim 10 wherein said swelling agent is about 25% to about 35% by weight of the animal litter.

12. An animal litter according to Claim 11 wherein said swelling agent is about 28% by weight of the animal litter.

13. An absorbent material comprising:

clay particles in the range of about -10 to about +50 mesh; and

a coating for said particles, said coating comprising a bentonite powder.

14. An absorbent material according to Claim 13 wherein said particles are agglomerated from clay fines of less than about -50 mesh in size.

15. An absorbent material according to Claim 13 wherein said coating comprises particles of about 200 mesh in size.

16. An absorbent material according to Claim 13 wherein said coating comprises particles in an amount of about 20% to about 40% by weight of said absorbent material.

17. A clumping animal litter comprising:

clay particles in the range of about -10 to about +50 mesh, said particles being agglomerated from clay fines of less than about -50 mesh in size; and

a coating for said particles.

18. A clumping animal litter according to Claim 17 wherein said coating comprises a bentonite powder.

19. A clumping animal litter according to Claim 17 wherein said coating comprises a bentonite powder and guar gum powder blend.

20. A clumping animal litter according to Claim 17 wherein said coating comprises an odor control agent.

21. A clumping animal litter according to Claim 17 wherein said coating comprises an anti-microbial agent.

22. A clumping animal litter according to Claim 17 wherein said coating comprises particles having a size range of about 300 mesh to about 60 mesh.

23. A clumping animal litter according to Claim 17 wherein said coating comprises particles with a size of about 200 mesh.

24. A clumping animal litter according to Claim 17 wherein said clay particles comprise at least one of Calcium-Montmorillonite, smectite, attapulgite, kaolin and opal, fines.

25. A clumping animal litter according to Claim 17 wherein said clay particles have a moisture content from about 20% to about 40% before being coated.

26. A clumping animal litter according to Claim 17 wherein said clay particles have a moisture content from about 28% to about 34% before being coated.

27. A clumping animal litter according to Claim 17 wherein said litter has a moisture content from about 5% to about 15%.

28. A clumping animal litter according to Claim 17 wherein said litter has a moisture content of about 8%.

29. A clumping animal litter according to Claim 17 wherein said coating is from about 20% to about 40% by weight of said litter.

30. A clumping animal litter according to Claim 17 wherein said coating is from about 25% to about 35% by weight of said litter.

31. A clumping animal litter according to Claim 17 wherein said coating is about 30% by weight of said litter.

32. A clumping animal litter according to Claim 17 wherein the clay fines are agglomerated in a pin mixer.

33. A method for manufacturing a clumping animal litter comprising:

agglomerating clay fines into particles; and

coating the particles with a powder.

34. A method according to Claim 33 wherein agglomerating clay fines comprises agglomerating clay fines using a pin mixer.

35. A method according to Claim 33 wherein agglomerating clay fines comprises agglomerating a blend of clay fines and bentonite fines using a pin mixer.

36. A method according to Claim 33 wherein agglomerating clay fines comprises agglomerating bentonite fines using a pin mixer.

37. A method according to Claim 33 wherein coating the particles comprises coating the particles with a bentonite powder.

38. A method according to Claim 33 wherein coating the particles comprises coating the particles with a bentonite powder and guar gum powder blend.

39. A method according to Claim 33 wherein coating the particles comprises coating the particles with a powder blended with a fragrance.

40. A method according to Claim 33 wherein coating the particles comprises coating the particles using at least one of a fluidized bed dryer, a semi-continuous centrifugal coater, and a rotary coating and drying system.

41. A method according to Claim 33 further comprising drying the coated particles.

42. A method according to Claim 41 wherein drying the coated particles comprises drying the particles to a moisture content from about 5% to about 15%.

43. A method according to Claim 33 wherein coating the particles comprises applying a powder in an amount of about 20% to about 40% by weight of a coated particle.

44. A method according to Claim 33 wherein coating the particles comprises applying a powder in an amount of about 25% to about 35% by weight of a coated particle.

45. A method according to Claim 33 wherein coating the particles comprises applying a powder in an amount of about 28% by weight of a coated particle.

46. A method according to Claim 33 wherein the powder comprises a swelling clay.

47. A clumping animal litter comprising:

clay particles in the range of about -10 to about +50 mesh in size; and

bentonite powder of about 200 mesh, said powder applied as a coating to said particles in an amount of about 20% to about 40% by weight.

48. A clumping animal litter according to Claim 47 wherein said clay particles are agglomerated from clay fines of less than about -50 mesh in size.

49. A clumping animal litter according to Claim 47 wherein said bentonite powder is sprayed in a low concentration solution on said clay particles placed in a fluidized bed.

50. A clumping animal litter according to Claim 47 wherein said litter has a moisture content of about 5% to about 15%.

51. A clumping animal litter according to Claim 47 wherein said litter has a moisture content of about 8%.

52. A clumping animal litter according to Claim 47 wherein said clay particles are agglomerated from a blend of clay fines and bentonite fines of about -50 mesh in size.

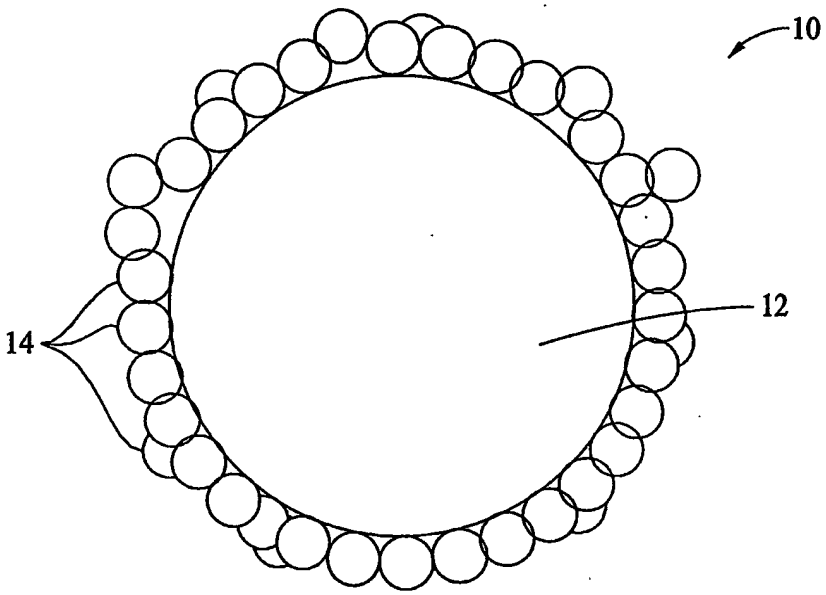

FIG. 1

Sample	15 min saline Cl. Wt.	15 min saline Cl. Str.	15 min urine Cl. Wt.	15 min urine Cl. Str.	1 hr urine Cl. Wt.	1 hr urine Cl. Str.	24 hr urine Cl. Wt.	24 hr urine Cl. Str.
A								
Control-	27.66	0.94	26.82	0.91	26.15	1.10	20.74	1.51
Blm 75/25	27.72	0.93	26.85	0.92	26.29	1.04	20.79	1.66
scoop blend	27.53	0.96	26.97	0.95	26.37	1.04	20.11	1.97
avg.	27.64	0.94	26.88	[illegible]	26.27	1.06	20.55	[illegible]
B	32.95	1.17	32.04	0.93	32.27	1.23	28.52	7.13
CMS prototype	32.97	1.26	31.54	1.16	31.23	0.95	27.38	7.80
#2	32.92	1.10	32.18	1.11	32.00	1.21	27.22	6.02
avg.	32.95	1.18	31.92	[illegible]	31.83	1.13	27.71	[illegible]
C	32.61	1.12	33.17	1.31	31.44	1.44	27.59	6.80
CMS prototype	32.74	1.42	33.65	1.29	28.99	1.09	27.08	5.81
#3	32.43	1.16	33.94	1.35	32.10	1.26	26.94	3.74
avg.	32.59	1.23	33.59	[illegible]	30.84	1.26	27.20	[illegible]
D	32.20	1.38	32.43	1.06	30.78	1.09	26.78	3.29
CMS prototype	31.86	1.25	33.16	1.59	31.84	1.66	26.98	3.03
#4	31.53	1.37	32.07	1.68	32.42	1.22	27.50	4.88
avg.	31.86	1.33	32.55	[illegible]	31.68	1.32	27.08	[illegible]
E	33.36	1.14	35.09	1.41	35.24	1.25	31.23	5.59
CMS prototype	34.37	1.23	34.61	1.26	35.43	1.69	29.45	3.66
#7	34.33	1.25	34.69	1.52	34.38	0.97	27.94	3.46
avg.	34.02	1.21	34.80	[illegible]	35.02	1.30	29.54	[illegible]
F	34.62	1.52	34.76	1.25	32.97	0.97	29.78	4.93
CMS prototype	34.17	1.23	35.34	1.45	34.17	1.02	29.64	4.48
#8	34.47	1.21	35.41	0.94	33.79	1.58	27.76	3.69
avg.	34.42	1.32	35.17	[illegible]	33.64	1.19	29.06	[illegible]

Note: Standardized male urine (sp. Gr. 1.050) was used for all urine clump strength testing. 2% Saline solution was used for all saline clump testing.

CMS Prototype Samples B through F are 70.0% Seed Base produced from by-product dust, and 30.0% 200 mesh Bentonite coating powder.

FIG. 2

A			B			C		
Screen Analysis			Screen Analysis			Screen Analysis		
mesh	grams	%	mesh	grams	%	mesh	grams	%
8	0	0	8	76.5	20.1	8	52.1	13.1
12	0.8	0.2	12	195.4	51.3	12	197.7	49.8
14	3.8	0.9	14	83.2	21.9	14	105.6	26.6
20	141	35.1	20	18.2	4.8	20	16.6	4.2
40	214.6	53.5	40	0.7	0.2	40	0.4	0.1
50	33.4	8.3	50	0	0	50	0	0
pan	7.8	1.9	pan	6.6	1.7	pan	24.9	6.3
Fin.Wt.	401.4		Fin.Wt.	380.6		Fin.Wt.	397.3	

D			E			F		
Screen Analysis			Screen Analysis			Screen Analysis		
mesh	grams	%	mesh	grams	%	mesh	grams	%
8	66.5	16.2	8	25.2	6.6	8	48.5	12.6
12	220.9	53.7	12	174.3	45.5	12	195.3	50.8
14	83.1	20.2	14	108.3	28.3	14	87.2	22.7
20	17.8	4.3	20	53.6	14	20	36.9	9.6
40	0.4	0.1	40	5	1.3	40	3.4	0.9
50	0	0	50	1.1	0.3	50	0.1	0
pan	22.7	5.5	pan	15.8	4.1	pan	13.3	3.5
Fin.Wt.	411.4		Fin.Wt.	383.3		Fin.Wt.	384.7	

Sample	Bulk Density (lbs./cu. Ft.)	Moisture (percent)
A	55.8	6.21
B	46.6	9.75
C	47.5	6.65
D	45.9	5.65
E	49.2	7.96
F	48.9	8.62

FIG. 3

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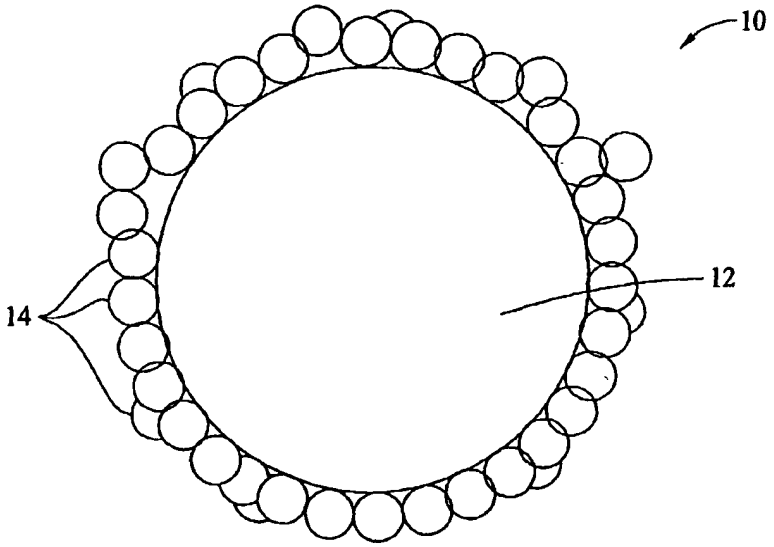
(54) Title: COATED CLUMPING LITTER



(57) Abstract: A clumping animal litter (10) is disclosed which includes clay particles (12) and a swelling agent (14) coated on the clay particles. In one embodiment, the clay particles are manufactured by agglomerating non-swelling clay fines.

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B. FIELDS SEARCHED

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U.S. : 428/403; 119/173

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,101,771 A (GOSS) 07 April 1992, entire document.	1-17, 20-37, and 39-46.
X	US 5,339,769 A (TOTH et al) 23 August 1994, entire document.	1-52.
X	US 5,975,019 A (GOSS et al) 02 November 1999, entire document.	1-52.
A	US 4,407,231 A (COLBORN et al) 04 October 1983, entire document.	1-52.
A	US 4,641,605 A (GORDON) 10 February 1987, entire document.	1-52.
A	US 5,094,189 A (AYLEN et al) 10 May 1992, entire document.	1-52.
A	US 5,421,291 A (LAWSON et al) 06 June 1995, entire document.	1-52.
A	US 5,469,809 A (COLEMAN) 28 November 1995, entire document.	1-52.
A	US 5,542,374 A (PALMER, Jr.) 06 August 1996, entire document.	1-52.

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
18 July 2003 (18.07.2003)	30 JUL 2003
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer H. Thi Le Telephone No. 703-308-2415

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INTERNATIONAL SEARCH REPORT

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,992,351 A (JENKINS) 30 November 1999, entire document.	1-52.